NOTES FROM PACIFIC COAST OBSERVATORIES.

The Effect of Gaseous Pressures on the Spectra of Iron and Titanium.

An investigation in the Pasadena laboratory of the effect of gaseous pressures between a partial vacuum and sixteen atmospheres upon the arc and spark spectra of iron and titanium has led to some results which have interesting applications to solar and stellar spectroscopy. The principal results may be summarized as follows:—

1. Reversal is a function of wave-length at these pressures, being most frequent in the more refrangible part of the spectrum and becoming less so toward longer wave-lengths. This has been found by other observers for higher pressures.

2. With reduction of pressure below one atmosphere, the enhanced lines in the spectrum of titanium become relatively stronger. It is possible that this result may account in part at least for the greater relative strength of the enhanced lines in the spectrum of the upper solar chromosphere, where the pressure undoubtedly is much lower than at the level of the main reversing layer.

3. The low temperature lines of iron appear to form a distinct group and have small displacements under pressure. A similar result was found for the displacements of the low temperature lines in the spectrum of the Sun's limb.

4. The remaining lines of iron may be divided into three groups, for which the displacements bear the approximate ratio 1 : 2 : 4, a result already found by Duffield.

5. There appears to be some evidence in favor of a direct relationship between pressure displacement and magnetic separation for iron when lines of the same group and of the same type of separation are considered. In the case of titanium,

for which it has not been possible to distinguish well-marked groups of lines, no evidence of a connection with magnetic separation is found.

6. The values of the average displacement for the four iron groups at different wave-lengths are well represented by a law of variation of displacement with the third power of the wave-length. If we form simple means of the displacements of the titanium lines for considerable portions of the spectrum, the values are well represented by a law of variation with the second power of the wave-length. The difference from iron may be due to the intermixture of various groups in the titanium spectrum. Measures of some calcium lines belonging to the second subordinate series indicate a variation of displacement according to the first power of the wave-length. The measures, however, are of low weight.

7. The displacements of the titanium arc lines are found to be accurately proportional to pressure for a range of from two to sixteen atmospheres above atmospheric pressure.

8. The enhanced lines as a rule show much larger displacements under pressure than do the other lines in the titanium arc spectrum and are almost always unreserved. The amount of displacement, however, depends upon each individual line and a few enhanced lines give very small values. A similar result has been found for the displacements of the enhanced lines in the spectrum of the Sun's limb and in the spectra of the stars *Sirius* and *Procyon*. If the effect in these stars is due to pressure, as seems probable, the laboratory results provide a means of measuring the effective pressures in the stellar atmospheres.

9. In an atmosphere of hydrogen the displacements of the enhanced lines are appreciably larger than in an atmosphere of air or carbon dioxide at the same pressure. The other lines show the same displacements.

10. The displacements of the lines in the titanium spark appear to be slightly larger on the average than in the arc, the largest difference being for the enhanced lines.

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